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Involuntary Smoking and Lung Cancer: A Case-Control Study[1]

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ABSTRACT—In a case-control study in 4 hospitals from 1971 to 1981, 134 cases of lung cancer and 402 cases of colon-rectum cancer (the controls) were identified in nonsmoking women. All cases and controls were confirmed by histologic review of slides, and nonsmoking status and exposures were verified by interview. Odds ratios (OR) increased with increasing number of cigarettes smoked by the husband, particularly for cigarettes smoked at home. The OR for women whose husbands smoked 20 or more cigarettes at home was 2.11 (95% confidence limits: 1.13, 3.95). A logistic regression analysis showed a significant positive trend of increasing risk with increased exposure to the husband's smoking at home, controlled for age, hospital, socioeconomic class, and year of diagnosis. Comparison of women classified by number of hours exposed a day to smoke in the last 5 years and in the last 25 years showed no increase in risk of lung cancer.—JNCI 1985; 75:463-469

Much interest has been expressed in the past several years in the reported relationship of involuntary or passive smoking and the development of lung cancer. Hirayama (*1*), in a prospective study in Japan, reported a 2:1 RR for nonsmoking women married to smokers as compared to the RR for nonsmokers married to nonsmokers. Trichopoulous et al. (*2*), in a study in Greece, found that nonsmoking women with husbands who smoked had an OR about 2.5 times as high as that of women with husbands who never smoked, and the OR rose to 3.4 in women whose husbands smoked more than one pack of cigarettes a day. In another case-control study, Correa et al. (*3*) found nonsmoking women married to smokers with a lifetime consumption of 41 or more pack years had an OR 3.5 times as high as the OR of women married to nonsmokers.

In an analysis of data from the American Cancer Society's prospective study, Garfinkel (*4*) found little if any increase in RR of lung cancer for nonsmoking women married to smokers (*4*). The RR was 1.34 for light smokers and 1.10 for those whose husbands smoked 20 or more cigarettes a day. Kabat and Wynder (*5*) in a pilot study found no extra lung cancer risk in women and in nonsmoking men exposed to smoke at home, but nonsmoking men exposed at work showed a slight increase in risk. Kabat and Wynder measured exposure both by the spouse's smoking habit and the subject's report of direct exposure.

An investigation by Sandler et al. (*6*) of relatively young cancer cases in North Carolina found an overall 1.6 OR (smokers and nonsmokers) for exposed vs. nonexposed cancer cases. Exposed cases were those in which the husband smoked. Exposed nonsmokers had a higher OR than that of exposed smokers. In nonsmokers the OR were elevated and statistically significant for cancers of the cervix, breast, and endocrine glands. Occurrence of cancer in the latter two sites previously had not been associated with cigarette smoking. Lung cancer also showed an elevated OR but was not statistically significant; however, the number of cases was small.

Two papers in Hong Kong by Chan and Fung (*7*) and by Koo et al. (*8*) show very little difference between cases and controls with respect to involuntary smoking and lung cancer.

Except for the two prospective studies, all of these studies were based on relatively few lung cancer cases in female nonsmokers; the number of cases ranged from 22 to 77 in various case-control studies.

In a previous paper, we pointed out that in any study of involuntary smoking and lung cancer, categorizing nonsmokers by the smoking habit of the spouse may lead to error in classification of exposure. In the United States particularly, there may be many women, married to nonsmokers, who are exposed to the smoke of others at work or in other areas. Conversely, some individuals married to smokers may suffer acute effects from inhaling smoke and consciously avoid such exposure. A survey of 38,000 subjects by Friedman et al. (*9*) confirmed this hypothesis. About 40% of women nonsmokers and 50% of men nonsmokers who were married to nonsmokers were exposed to the smoke of others for some periods of time during a week, and 47% of nonsmoking women married to smokers reported that they were not exposed to tobacco smoke at home. In the study reported here, we record the smoking habit of husbands (total No. of cigarettes smoked and No. smoked at home), as well as the number of hours a day the subjects were exposed to the smoke of others at home, at work, and in other areas.

Other causes for concern are establishment of the microscopic diagnosis of primary lung cancer and

ABBREVIATIONS USED: CL=confidence limits; OR=odds ratio(s); RR=relative risk(s).

[1] Received April 22, 1985; accepted June 20, 1985.

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verification of the smoking history. In a study of the histologic type of lung cancer in relation to asbestos exposure, 49 of 774 men and women with a discharge diagnosis of microscopically proved lung cancer were recorded as nonsmokers in the hospital chart (*10*). After review of hospital records, histologic sections, and interviews, only 10 cases remained who had died of primary lung cancer and who had never smoked. One-half of the others had smoked at some time and, one-half the confirmed nonsmokers had a primary cancer other than that of the lung.

It is apparent, therefore, that more studies on involuntary smoking are needed, with particular attention given to obtaining microscopic proof of primary lung cancer and more detailed information about exposures to cigarette smoke.

METHODS

To have available enough subjects for a case-control study of involuntary smoking, we obtained access to the records of 4 hospitals—3 in New Jersey and 1 in Ohio. In each of these institutions, we identified all lung cancer cases in women recorded during 1971-81. In 2 hospitals the cases were selected from the Tumor Registry; in 1 hospital, they were selected from the surgical index in the pathology department; and in the other hospitals, records from the pathology laboratory were checked against the medical records diagnostic discharge index. No case was selected that had been diagnosed prior to 1971. Cases with cancer of the colon-rectum served as controls. Colon-rectum cancers have been shown in epidemiologic studies not to be related to cigarette smoking. Charts then were located and reviewed. Cases that were diagnosed clinically only or by cytology, or as sarcoma or lymphoma of the lung, were excluded. Those that occurred in smokers (or ex-smokers), according to hospital records, also were set aside. Only those charts in which the patient was specified as a nonsmoker, or in which the smoking habit was not recorded, were further investigated.

All the slides for these cases and controls were pulled from the files (an average of ≈15 slides/case) and were reviewed blind (by O. A.). In a small sample, slides for cases and controls were reviewed a second time to check consistency of the findings. Another sample of slides for smokers with lung cancer, and for subjects with diagnoses of sites other than lung or colon-rectum, also were selected for histologic review and were mixed in with the slides of nonsmokers. If slides were missing or not available, or of too poor quality for accurate diagnosis, the blocks for the case were located and new slides were prepared.

An interview based on a standard questionnaire was obtained for all cases and controls, along with microscopic proof. The interview was with the woman if she were still alive or with next of kin if she had died. Seven interviewers did all the questioning; three did interviewing in all 4 hospitals. About three-quarters of the interviews were with the patient or with spouse or children. All other informants had known the subject for at least 25 years and were able to supply the necessary information. All interviews were reviewed by the supervisor. When the information was incomplete, another respondent was contacted. A second interview was obtained in about 10% of the cases and controls.

Women who had never married and who lived with another member of the family were classified according to their relative's smoking habits. Therefore, the word "husband" as used in this paper means husband or cohabitant living in the same household. Of the cases, 57% were married and living with their husbands at the time of the cancer diagnosis. The interview included questions on current smoking habits of the husbands of the cases and controls up to the present time or to the time of death; on the number of cigarettes smoked per day at home, and the number of years they had smoked. The interviewer also asked about the average number of hours a day the woman had been exposed to the smoke of others at any time during the past 5 years, during the past 25 years at home, while at work and in other areas, and during her childhood. Women whose husbands smoked cigarettes only occasionally were counted as not exposed; occasional exposure at home, work, or in other areas also was counted as not exposed.

We matched 1 lung cancer case to 3 colon-rectum cancer cases. Controls were matched to within 5 years of age and were from the same hospital. In most age groups there were many colon-rectum cancers in women of the same ages for matching purposes. The colon-rectum cases were checked for histologic proof in the same way as were the lung cancer cases, and the smoking interviews were obtained by the same interviewers who obtained the lung cancer interviews. The interviewers were not told the diagnoses, nor did they know the hypothesis of the study.

Several different analytic procedures were used: The Mantel-Haenszel procedure for obtaining a point estimate of the OR with a 1:3 match was employed, as adapted by Pike and Morrow (*11*), with CL as shown by Miettinen (*12*). To compare subgroups of exposures, the matching was broken, and OR and CL were computed by the Mantel-Haenszel method. In addition, a logistic regression model was used, with estimation and testing procedures as given by Breslow and Day (*13*).

To permit comparison with previous studies, the subjects' exposures to cigarette smoke were classified in several different ways: 1) exposure over the last 5 years, 2) exposure over the last 25 years, 3) exposure to cigarettes smoked by husband, and 4) exposure to cigarettes smoked by husband at home.

RESULTS

Table 1 shows the process through which data for 134 cases of lung cancer in nonsmoking women were obtained from the four hospitals. Of 1,175 women listed as having lung cancer, 892 (76%) were smokers or had smoked in the past, according to hospital records. Of the 283 remaining women, 36 (12.7%) were proved histologically to have other than lung cancer upon

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TABLE 1.—*Lung cancer in women who never smoked. Records of 4 hospitals, 1971–81*

Status	No. of women examined					
	At hospitals:				Total	%
	A	B	C	D		
Microscopic proof of lung cancer on hospital record	243	93	276	563	1,175	
Smoker	200	70	182	440	892	
Nonsmoker or smoking habits not stated[a]	43	23	94	123	283	100.0
Reinterview revealed smoker	15	3	41	54	113	39.9
Reinterview revealed nonsmoker	18	14	45	57	134	47.3
No microscopic proof of lung cancer	10	6	8	12	36	12.7

[a] 68% of the hospital records listed patient as nonsmoker; in 32% of the records, smoking habits were not stated.

review of slides by one of us (O. A.), and 113 (39.9%) were found to be smokers upon reinterview. Only 134 (47.3%) were lifetime nonsmokers with histologically proved primary lung cancer. They were the only cases therefore suitable for this study. Among the colon-rectum cases, there were many fewer that were misdiagnosed—only 1.4%.

The age distribution of the cases and controls is shown in table 2. More than half were 70 years of age or older, and 22% were 80 years of age or older at the time of diagnosis. The histologic diagnosis of lung cancer cases was as follows: 65% adenocarcinoma, 16% large cell, 8% squamous cell, 4% oat cell, 3% alveolar cell, 3% mixed, and 1% too undifferentiated for classification by cell type.

Table 3 shows the OR and CL for risk of lung cancer, according to the 4 methods of classifying smoke exposure. The OR ranged from 1.13 to 1.31. All 4 methods resulted in lower 95% CL of less than 1 and were not statistically significant.

Table 4 shows the average number of hours per day that cases and controls were exposed to other people's

TABLE 2.—*Age distribution of lung cancer cases and controls*

Age, yr	Cases		Controls	
	No.	%	No.	%
40–49	5	3.7	17	4.2
50–59	28	20.9	86	21.4
60–69	28	20.9	88	21.9
70–79	44	32.9	121	30.1
80–89	24	17.9	82	20.4
≥90	5	3.7	8	2.0
Total	134	100.0	402	100.0

TABLE 3.—*OR for matched groups of women for risk of lung cancer from exposure to smoke, as classified in 4 categories*

Classification	Risk of lung cancer for women	
	OR	CL
Exposed to smoke over last 5 yr	1.28	0.96–1.70
Exposed to smoke over last 25 yr	1.13	0.60–2.14
Husband smoked	1.22	0.97–1.71
Husband smoked at home	1.31	0.94–1.83

smoke for the last 5 years and for the last 25 years. The women exposed during the last 5 years had an OR (adjusted for hr exposed per day) of 1.28 (95% CL: 0.98, 1.66) and those exposed for the last 25 years had an OR of 1.12 (CL: 0.81, 1.42). No increasing trend with increasing exposure was apparent in either group. In the 5-year exposure group, the OR went down with increased exposure, but the OR in each of the exposure groups was not statistically significant.

Table 5 and text-figures 1 and 2 show exposure classified by the husband's smoking habits. The OR for women married to smokers was 1.23 (CL: 0.94, 1.60); for those whose husband smoked at home it was 1.31 (CL: 0.99, 1.73). Women whose husbands smoked 40 or more cigarettes a day had an OR of 1.99 (CL: 1.15, 3.50). Women whose husbands smoked 20 or more cigarettes at home had an OR of 2.11 (CL: 1.13, 3.95). These were the only specific smoking groups in which the OR were statistically significant. The Mantel extension test for

TABLE 4.—*Number of cases and controls exposed to smoke of others during 5 and 25 yr before diagnosis*

Variable	Exposure, No. of hr/day					Total No. of women
	None	1–2	3–6	≥7	Total	
Last 5 yr						
No. of cases	80	15	25	14	54	134
No. of controls	263	31	59	49	139	402
OR	1.00	1.59	1.39	0.94	1.28	
95% CL		0.90–2.72	0.96–2.03	0.69–1.28	0.98–1.66	
Last 25 yr						
No. of cases	42	17	45	30	92	134
No. of controls	136	72	109	85	266	402
OR	1.00	0.77	1.34	1.14	1.12	
95% CL		0.60–0.99	0.96–1.87	0.83–1.57	0.81–1.42	

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TABLE 5.—*Smoke exposure before lung cancer diagnosis, as classified by husband's smoking habits*

Variable	Husband's total smoking habits						
	None[a]	Cigarettes/day			Cigar and/or pipe	All types of smoking	Total No. of women
		<20	20–39	≥40			
No. of cases	43	11	32	30	18	91	134
No. of controls	148	45	102	52	55	254	402
OR[b]	1.00	0.84	1.08	1.99	1.13	1.23	
95% CL		0.61–1.16	0.81–1.44	1.13–3.50	0.78–1.62	0.94–1.60	
	Husband's smoking habits at home						
	None[a]	Cigarettes/day			Cigar and/or pipe	All types of smoking	Total No. of women
		<10	10–19	≥20			
No. of cases	44	29	17	26	18	90	134
No. of controls	157	90	56	44	55	245	402
OR[c]	1.00	1.15	1.08	2.11	1.17	1.31	
95% CL		0.84–1.58	0.76–1.54	1.13–3.95	0.80–1.70	0.99–1.73	

[a] Figures include single women living alone. Cohabitants living with single women were classified as "husbands."
[b] Mantel extension test for trend (one tailed): $\chi = 2.31$, $P<.025$.
[c] Mantel extension test for trend (one tailed): $\chi = 2.35$, $P<.025$.

trend in both groups was statistically significant ($P<.025$, one-tailed test).

Analysis also was done for years of smoking. There were statistically significant OR for those smoking for 20–29 years (2.25 for total smoking habits and 2.17 for smoking at home), but no trend was apparent. Those who reported smoking for 30–39 years and 40 years or more had much lower OR that were not statistically significant.

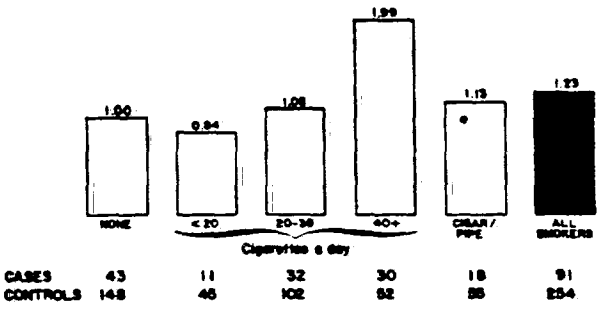
Table 6 shows OR for exposure categories by age group, histologic type of lung cancer, identity of the respondent who was interviewed, and socioeconomic status. Data are for average exposure for the last 5 years, for the last 25 years, by husband's total smoking habit, and by his smoking habits at home. OR generally were higher for those 70 years of age or over, for those with adenocarcinoma, when someone not in the immediate family was the respondent, and for those in the lower or lower middle class. There does not appear to be a pattern of high OR for any of these subgroups in all 4 exposure categories. Some of the OR are statistically significant, but they usually carry very wide CL with them.

Table 7 shows the OR for classification of exposure of women to smoke at home, at work, and in other areas, as compared with those women not exposed at all. OR for exposure at work during the last 5 years was 0.88; for the last 25 years, it was 0.93. The highest OR observed was 1.77 for exposure during the last 5 years in "other areas." None of the RR shown in this table are statistically significant.

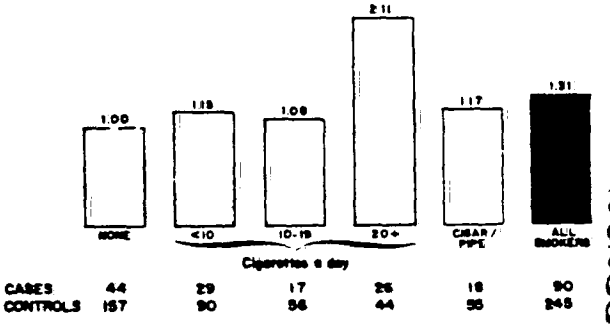
One of the questions in the interview was with regard to exposure to smoke in childhood. Those women who replied that they had been exposed in childhood had an RR of 0.91 (CL: 0.74, 1.12).

LOGISTIC REGRESSION ANALYSIS

An unconditional logistic regression model was used—which included terms for age, hospital, socioeconomic status, and year of diagnosis—to account for possible confounding factors. Testing was done on each of the four exposure variables, three of which were used in the Mantel-Haenszel analysis: 1) exposure during the last 5



TEXT-FIGURE 1.—OR for exposure to husband's total smoking habits.



TEXT-FIGURE 2.—OR for exposure to husband's smoking habits at home.

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TABLE 6.—*OR for smoke exposure categories, by age group, histologic type of lung cancer, identity of respondent, and socioeconomic status*

Specification	No. of cases	Smoke exposure							
		Last 5 yr		Last 25 yr		Husband's smoking habits			
						Total		At home	
		OR	95% CL	OR	95% CL	OR	95% CL	OR	95% CL
Age, yr									
<60	33	0.96	0.65–1.42	1.00	0.63–1.51	1.19	0.72–1.98	1.30	0.75–2.26
60–69	28	0.82	0.57–1.19	0.55	0.41–0.73	1.20	0.66–2.19	1.42	0.70–2.88
70–79	44	1.82	0.93–3.53	1.22	0.78–1.90	1.26	0.79–1.99	1.43	0.85–2.39
≥80	29	2.00	0.76–5.25	1.75	0.81–3.78	1.28	0.72–2.27	1.10	0.68–1.79
Histologic type									
Adenocarcinoma	87	1.43	0.99–2.06	1.15	0.85–1.56	1.33	0.94–1.87	1.48	1.01–2.17
Squamous cell carcinoma	11	1.28	0.52–3.19	0.85	0.43–1.69	5.00	1.28–19.33	5.00	1.43–20.18
Large cell carcinoma	21	0.55	0.41–0.74	0.67	0.47–0.94	0.76	0.51–1.13	0.62	0.45–0.86
Mixed and other	15	2.29	0.57–9.10	2.67	0.41–17.35	0.81	0.48–1.37	1.00	0.53–1.77
Respondent									
Self	16	1.96	0.62–6.17	0.91	0.51–1.60	0.83	0.50–1.38	1.00	0.55–1.74
Husband	34	1.00	0.67–1.52	0.46	0.38–0.55	0.77	0.56–1.06	0.92	0.63–1.34
Daughter or son	48	0.92	0.67–1.26	1.41	0.85–2.36	3.57	0.84–15.28	3.19	0.91–11.19
Other	36	2.23	0.90–5.54	2.23	0.83–5.96	1.58	1.11–2.67	0.77	0.57–1.03
Socioeconomic status									
Upper and upper middle class	6	1.60	0.31–8.19	1.50	0.34–6.59	1.23	0.36–4.18	1.50	0.34–6.59
Middle class	75	0.78	0.63–0.97	0.92	0.71–1.19	1.15	0.84–1.59	1.21	0.87–1.69
Lower and lower middle class	53	2.58	1.10–6.01	1.45	0.86–2.44	1.23	0.83–1.84	1.45	0.88–2.38

years, 2) exposure during the last 25 years, 3) husband's smoking at home, and 4) husband's smoking outside the home. The latter variable was used rather than the husband's total smoking as a check of the validity of exposure to husband's smoke and was derived by subtracting the number of cigarettes smoked at home from the total number of cigarettes the husband smoked per day. Each of these factors was tested as a continuous exposure variable—the most powerful technique for detecting any true underlying risk.

Table 8 shows the results of this analysis. Exposure for 5 years and 25 years had negative coefficients. The test for cigarettes smoked by husband at home showed a positive trend of increasing risk with increasing exposure and was statistically significant, with a *P*-value (one tailed) of .032. The test for cigarettes smoked outside the home was not statistically significant. The table also shows estimates of RR at the 10 hours per day exposure level and at 20 cigarettes per day smoked by the husband. The RR from exposure to 20 cigarettes/day smoked at home was 1.70; outside the home, it was 1.26. RR from exposure during the last 5 years and during the last 25 years were less than 1. A separate analysis that included respondent identity did not change the results materially.

TABLE 7.—*Number of cases and controls exposed to smoke of others at home, at work, and in other areas*

Variable	Smoke exposure			
	None	At home	At work	In other areas
Last 5 yr				
No. of cases	80	37	14	13
No. of controls	262	99	52	24
OR	1.00	1.22	0.88	1.77
95% CL		0.92–1.62	0.66–1.18	0.93–3.38
Last 25 yr				
No. of cases	42	73	34	19
No. of controls	135	204	118	43
OR	1.00	1.15	0.93	1.42
95% CL		0.89–1.49	0.73–1.18	0.89–2.26

TABLE 8.—*Logistic regression model[a] for involuntary smoke exposure variables, on continuous dose-response basis*

Variable	Coefficient (SE)	*P*-value[b]	Smoke exposure level	RR[c]
5-yr exposure to smoke	−0.0069 (0.0035)	0.422	10 hr	0.93
25-yr exposure to smoke	−0.016 (0.031)	0.303	10 hr	0.85
Cigarettes smoked at home	0.026 (0.014)	0.032	20 cigarettes	1.70
Cigarettes smoked outside home	0.012 (0.010)	0.127	20 cigarettes	1.26

[a] Model includes terms for age, hospital, socioeconomic status, and year of diagnosis.
[b] One tailed.
[c] Relative to the nonexposed woman.

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DISCUSSION

In a previous paper (*1*) the problem of classifying involuntary smoking on the basis of the husband's smoking habit was discussed. It was pointed out that questions directed at ascertaining a quantitative estimate of the number of hours a day that subjects were exposed might be a better measure than the total number of cigarettes that the husband smoked, inasmuch as not all of the husband's smoking was done at home. In the present study we classified the exposure both ways: by the number of hours per day the subjects were exposed to smoke of others and by the husband's smoking habits. We also recorded the respondent's estimate of how many cigarettes a day the husband smoked at home. In this group of women, husbands who smoked cigarettes smoked an average of 27 cigarettes a day, of which 11.5 cigarettes on average (43%) were smoked at home. Of course, all cigarettes smoked at home were not necessarily smoked in a room where the subject could have been exposed. In this study, the husband's smoking at home was related to the women's lung cancer, whereas number of hours of exposure a day to all sources of tobacco smoke was not related.

A potential source of error was the hospital's report of whether the subject smoked or not. In this study, 40% of the women with lung cancer, classified as nonsmokers (or smoking not stated) on the hospital record, were smokers at some time (table 1). Another 13% did not have primary lung cancer. It is apparent, therefore, that in any study of involuntary inhalation and lung cancer, the smoking histories of the subjects have to be confirmed as well as the extent of their involuntary exposures. Smoking histories of husbands were obtained for the 113 women who were smokers. The distribution by smoking habit is shown in table 9. As we might have expected, smokers are more likely to be married to smokers than are nonsmokers. The table shows that 43 of 134 women, or 32.1%, of the cases included as never smoked in this study had husbands who never smoked; but only 21 of 113, or 18.6%, of women who smoked and were mistakenly classified as nonsmokers in the hospital record had husbands who did not smoke. Among the controls only 8.5% of women who were called nonsmokers (or smoking was not stated) were smokers.

The table shows the effect on the OR, when one assumes that 8.5% of the additional controls needed for the 1:3 match had husbands with the same smoking distribution as the husbands of cases who were smokers, and that the balance had the same distribution as that of the 402 controls included in the study. The OR for the husband's smoking increase to 1.61 overall and are as high as 1.63 for the 20–39 cigarette a day smokers and 2.32 for the women whose husbands smoked 40 or more cigarettes a day. For exposure to the husband's smoke at home, the OR are 1.66 overall, 1.53 for women whose husbands smoke 10–19 cigarettes a day, and 2.85 for those whose husbands smoke 20 or more a day at home. Thus the inclusion of women whose smoking habits have not been reviewed greatly increases the OR.

TABLE 9.—*Hypothetical OR resulting from combining women in study with women originally classified as nonsmokers but who actually smoked*

Variable	Husband's total smoking habits						
	None	Cigarettes/day			Cigar and/or pipe	All types of smoking	Totals
		<20	20–39	≥40			
No. of cases							
Nonsmokers (in study)	43	11	32	30	18	91	134
Smokers (originally called nonsmokers)	21	9	43	24	16	92	113
Total (unscreened)	64	20	75	54	34	183	247
No. of controls							
Nonsmokers (in study)	148	45	102	52	55	254	402
Additional controls*	119	38	90	45	47	220	339
Total (unscreened)	267	83	192	97	102	474	741
OR	1.00	1.01	1.63	2.32	1.39	1.61	
	Husband's smoking habits at home						
	None	Cigarettes/day			Cigar and/or pipe	All types of smoking	Totals
		<10	10–19	≥20			
No. of cases							
Nonsmokers (in study)	44	29	17	26	18	90	134
Smokers (originally called nonsmokers)	23	22	22	30	16	90	113
Total (unscreened)	67	51	39	56	34	180	247
No. of controls							
Nonsmokers (in study)	157	90	56	44	55	245	402
Additional controls*	126	75	52	39	47	213	339
Total (unscreened)	283	165	108	83	102	458	741
OR	1.00	1.31	1.53	2.85	1.41	1.66	

* Upon reinterview, 8.5% of the controls were found to be smokers. They were distributed according to the smoking distribution of husbands of cases who were smokers. The balance were distributed according to the smoking habits of controls in the study.

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The classification used in this study might be criticized because some women married to ex-smokers could be counted in the same exposure category as a woman exposed to smoke up to the time of her final illness. However, all patients who have gone through diagnosis and treatment for lung cancer had some period of time when they were not exposed to others' smoke, either before or after treatment. We believe that the classification we used was indicative of the "usual amount of smoke to which the person was exposed." To determine the experience of a "pure" nonexposed group, 17 cases and 56 controls in this study were identified who were not exposed to the smoke of others during the last 5 years, during the last 25 years, whose husbands never smoked at home or elsewhere, and who never were exposed to smoke in their childhood. These cases and controls were compared with all other subjects. The OR was 1.14 (CL: 0.81, 1.59).

In conclusion, we found an elevated risk of lung cancer, ranging from 13 to 31%, in women exposed to the smoke of others, although the increase was not statistically significant. The women who were married to smokers of 40 or more cigarettes a day or who were exposed to the smoke of at least 20 cigarettes a day at home showed a risk twice as high as that of women not exposed at all. This result is consistent with the dose-response risk of exposure to the husband's smoke shown in some case-control studies (*2*, *3*). A dose-response relationship was confirmed in a logistic regression analysis. The lack of a relationship when exposure was classified by hours exposed to smoke of others may have occurred because this variable does not accurately measure intensity of exposure. There is no consistently higher risk for certain age groups or by histologic types, or by exposure at home or at work. Exposure in other areas carried a higher OR, but this finding is difficult to interpret.

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